DOCUMENT RESUME

ED 460 836 SE 062 405

AUTHOR	Usiskin, Zalman, Ed.
TITLE	Who Should Determine What You Teach?
INSTITUTION	National Council of Teachers of Mathematics, Inc., Reston, VA.
PUB DATE	1999-04-00
NOTE	18p.; Theme issue.
AVAILABLE FROM	National Council of Teacher of Mathematics, 1906 Association Drive, Reston, VA 20191-1593.
PUB TYPE	Collected Works - Serials (022)
JOURNAL CIT	Mathematics Education Dialogues; v2 n2 Apr 1999
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Academic Standards; Elementary Secondary Education; *Mathematics Curriculum; *Mathematics Education

ABSTRACT

The purpose of this publication is to provide a forum through which National Council of Teachers of Mathematics (NCTM) members can be well informed about compelling, complex, timely issues that transcend grade levels in mathematics education. This issue focuses on mathematics curriculum issues and standards. In the United States and Canada, each of the following plays a role in determining what mathematics is taught to students in grades K-12: state or provincial authorities, standardized-test designers, recommendations of professional organizations, college-entrance requirements, textbooks, local school boards, and teachers in their classrooms. People in a broad range of positions present their views on the wisdom of decisions being made at various levels. (ASK)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 460 836

Mathematics Education Dialogues:

Who Should Determine What You Teach?

Zalman Usiskin, Editor

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

J. Carpenter

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

BEST COPY AVAILABLE

A PUBLICATION OF THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

APRIL 1999

Mathematics Education

Dialogues

Who Should Determine What You Teach?

In the United States and Canada, each of the following plays a role in determining what mathematics is taught to students in grades K–12: state or provincial authorities, standardized-test designers, recommendations of professional organizations, college-entrance requirements, textbooks, local school boards, and teachers in their classrooms.

In some other countries, ministries of education decide what mathematics should be taught. Even in the United States, known for local control, the federal government plays a role by providing funds for efforts such as remedial programs or by specifying guidelines that deal with the difficulties faced by students with disabilities. All of these players are influenced by parents, psychologists, mathematicians, educators, politicians, and others interested in education.

For critics of schools, every role player is a potential target for criticism. Curiously, though, not every role player is singled out for praise when things are going well. We seldom hear good things said about test designers, textbooks, and local school boards, even when their decisions or policies have been instrumental in helping students learn. And credit is too seldom given to the most pivotal of all decision makers, teachers of mathematics.

Some people believe that teachers, who are closest to their students and who know their local situation better than outsiders, should make the decisions regarding what is taught. Others think that decisions should be more centrally made, at the school level, school-district level, state or provincial level, national level, or even at the international level. There are also a variety of views regarding the roles of textbooks and tests in these decisions.

In this issue of *Dialogues* we have asked people in a broad range of positions to present their views on the wisdom of decisions being made at various levels. We could not cover all aspects of this question in one issue nor present all possible opinions. Nevertheless, we hope that you find the discussion to be interesting and useful.

Zalman Usiskin, editor
for the Editorial Panel

Inside this issue ...

- I Determine the Curriculum ... But Should I? 2
- Vermont and Local Control 3
- Toward a National Consensus 3
- *Who Should Set the Standards?* 4
- A Reaction to: *Who Should Set the Standards?* 5
- It's Time for a Global Mathematics Curriculum 6
- The Western Protocol 8
- Line Dancing in Texas 9
- The Influence of Postsecondary Education 10
- Standards: A Resource for Curriculum 10
- Determining What Is to Be Taught 11
- Who's in Control? 12
- Reactions to Tracking, from the previous issue of *Dialogues* 14
- Questionnaire 15

The purpose of *Mathematics Education Dialogues* is to provide a forum through which NCTM members can be well informed about compelling, complex, timely issues that transcend grade levels in mathematics education. The opinions expressed in this publication are those of the writers and do not constitute an official position of the NCTM. *Mathematics Education Dialogues* is published as a supplement to the *News Bulletin* by the National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 20191-1593. Pages may be reproduced for classroom use without permission.

BEST COPY AVAILABLE

I Determine the Curriculum! ... But Should I?

by Adam Deutsch

Currently I determine what I teach in my classroom. I suspect that there are many schools and districts around the country where this is the norm. Although I am perfectly happy with this arrangement, I believe it creates a dangerous system of education. At the risk of sounding immodest, I am a good teacher with creative ideas and a talent for developing good teaching tools. I create my own curriculum because I work in a district that has not developed a standard 9–12 curriculum, has in place outdated curricular materials that are difficult to use, and has not developed up-to-date course outlines for use with the adopted materials. In order to teach effectively, I invent my own curriculum.

I also believe that I am probably in a minority of teachers who, finding themselves in a position where they must create their own syllabi, timelines, and curricular materials, do so competently, creatively, and in alignment with nationally recognized standards. Many teachers might do a poor job of constructing a curriculum and therefore would not be effective teachers. Sadly, this is not because they are bad teachers, or uncaring teachers, but rather because most simply do not have the time or are not prepared or qualified to develop a curriculum. No teacher should really be put in such a position in the first place.

All schools should have access to a curriculum based on strong standards, and all teachers should have access to quality materials designed around those standards. The only way to ensure that this happens is through a national curriculum. Most school districts have neither the time, the resources, nor the people necessary to develop a strong and effective curricular system. Though many states have begun the process of centralizing and upgrading standards and curricula, many of those efforts are floundering for the reasons already given (lack of qualified people and sufficient resources). The efforts that are succeeding are creating throughout the country an unbalanced and inequitable educational system. It is hardly fair to children that the quality of their education is based simply on where they live. The unfair system has been in place for decades now, and so resistance to "centralizing" education is fierce. Still, if we truly hope to meet the goal of effective education based on standards and assessed on the basis of real-time performance, a national curriculum is needed.

Unfortunately, the federal government will likely not provide the leadership and direction needed to develop such a curriculum any time soon. Politics and the pervasive air of regionalism in the United States will bar efforts to centralize curriculum in this way. If the federal government is unable or unwilling to produce a mandatory national curriculum, perhaps it is time for NCTM to take the *Standards* one step further and deliver a rigorous national curriculum that is aligned to its Standards. A monumental task, but if not NCTM, then who? ●

Adam Deutsch teaches grades 9–12 mathematics in the public schools of Pittsburgh, Pennsylvania. Previous to that, he worked as a research specialist at the Learning Research and Development Center of the University of Pittsburgh. He stresses mathematical communication in his classes, having students write and read mathematical papers.

Vermont and Local Control

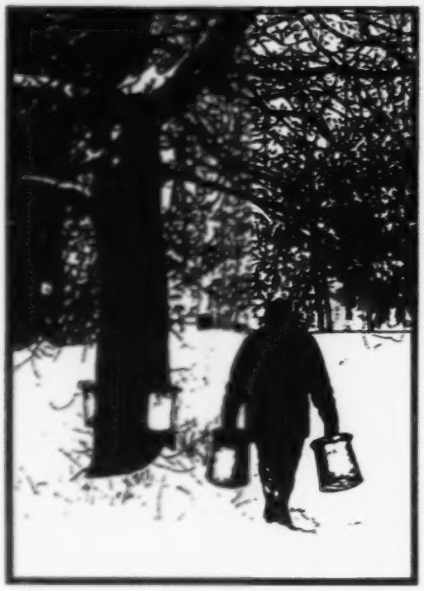
by Bruce Parker

Vermont—snow-covered fields, rolling Green Mountains, maple syrup, and independence. We carry local control to extremes ... only slightly over 100 000 K–12 students in the state, yet we have 341 schools, most with their own school boards. In theory, this allows each school and teacher to make the best decisions for their students. In practice, these decisions often vary dramatically, even between neighboring classrooms or grades.

Teachers and schools in Vermont needed a common reference to establish how effectively we were preparing our students. Statewide, we began to use the *New Standards Reference Exam* annually at grades 4, 8, and 10. The preliminary assessment results indicate that some mathematics programs, used consistently across grades and classrooms, provide superior results when implemented with suitable teacher training and support. When this quality implementation is missing, however, good programs yield marginal results.

Now we are being held accountable as schools, and series of schools, to improve student results. The long-term goal is that every student will meet or exceed the "standard," which is a tremendous challenge, far beyond our current circumstances. For teachers, it is a new and tough way to work—to be part of a larger group that wants a part in "my" text or program decision. Beginning now, issues like class size, "mainstreaming," integration of curricula, etc. need to meet the goal of increased student results.

The question isn't who *controls* education; it is who *assures* that each student receives a quality education. Ultimately, that depends on the interaction between the students and their own classroom teachers. We need reliable information; we need resources and training; we need support to motivate students to want to learn. We need to serve more effectively the students who move between schools. The NCTM *Standards* have helped us. Will a national curriculum? I'm not convinced. ●



Bruce Parker spent 16 years in industry as an engineer and a manager, nationally and internationally, before becoming a teacher 12 years ago. He recently served as a "Teacher Associate" to the Vermont Institute for Science, Math, and Technology (VISMT) and the Vermont Department of Education and is now back as a full-time classroom teacher. His family has lived in Vermont for six generations, including four on the farm that he and his children now own.

Toward a National Consensus

by William H. Schmidt

One of the most salient and powerful policy implications from the Third International Mathematics and Science Study (TIMSS) is the essential role that curriculum plays in teaching and learning mathematics. The TIMSS achievement results suggest a disturbing pattern—the relative standing of U.S. students compared with other countries declines from 4th grade to 12th grade. The U.S. mathematics curriculum over these same grade levels has been characterized as highly repetitive, lacking coherence, and not focusing on rigorous content, as defined internationally.

How did we get such an unfocused and incoherent curriculum? This often-asked question is difficult to answer empirically. However, I and my colleagues offer a hypothesis or hunch. Instead of a focused vision (which most TIMSS countries have) that would articulate what children at each grade level need to know in mathematics, the U.S. system has a splintered vision that is the likely consequence of dispersed decision making, a practice found throughout the United States. How we organize schooling and, in particular, the curriculum is the result of an accumulation of many choices forged over time to reflect our values and beliefs. Dispersed decision making regarding

See Toward a National Consensus, page 5

Bill Schmidt teaches at Michigan State University, East Lansing, Michigan, and oversees the participation of the United States in the Third International Mathematics and Science Study (TIMSS).

"Who Should Set the Standards?"

by Matthew Miller, a columnist for the *Los Angeles Times*. (Copyright, 1997, *Los Angeles Times*. Reprinted by permission.)

Republicans just killed President Bill Clinton's plan for national tests for fourth-grade reading and eighth-grade math, saying that anything that smacks of national standards undermines local control over schools.

Lost in the partisan shouting, however, was an indisputable fact: National education standards *already exist*, set indirectly by a handful of publishing giants whose textbooks guide instruction in classrooms across the country.

Here's how it works. Textbook publishing for grades K–12 is big business, with $3.5 billion in sales last year. Five companies—Simon and Schuster, McGraw-Hill, Houghton Mifflin, Harcourt General and Addison Wesley Longman—make up 70 percent of the market.

Since California, Texas and Florida account for 25 percent of book purchases, the Big Five publishers regularly develop new texts around the desires of the Big Three states, then adapt them slightly, at low cost, for other states.

This process, not surprisingly, produces look-alike books. School-division presidents at Simon and Schuster, McGraw-Hill and Addison Wesley Longman tell me that, broadly speaking, 80 percent of their texts' content doesn't vary from state to state.

In turn, researchers say, these texts—along with the teacher's guides, lesson plans and other materials publishers offer as accessories—have enormous influence over classroom instruction. That's especially true for younger teachers, who are more likely than classroom veterans to use text as a script rather than a resource.

If we do, therefore, have a tacit national curriculum, the key question is whether it's any good. Views vary. Publishers say their books' sameness reflects good news: There's broad professional consensus on what topics should be taught when.

Just about everyone, for example, teaches addition and subtraction in first grade, division in third. "We find a tremendous amount of overlap in what states are looking for," says McGraw-Hill schools division chief Roger Rogalin.

Critics find the situation less benign. The desire to keep each state happy by including local favorites (like the Alamo or "whole language" reading) balloons texts until they cover too many subjects too superficially. Meanwhile, California, Texas, and Florida (plus 17 other states) approve books for statewide use through a politicized process marred by ideological warfare, shoddy analysis and occasional corruption.

In more liberal states, for example, publishers scramble to meet quotas for photos of minorities or disabled people; a conservative protest in Texas got the New Deal taken off one text's timeline of key events in U.S. history.

Text reviewers often have little time to read the books; instead, critics say, they flip through pages, impressed by glossy designs, then cover their behinds by pointing to publisher-provided "correlation analyses" (glorified computer word searches) that purport to "prove" how a text teaches state-required skills.

Like most government contracting, text buying also has seen its share of scandal. California, for instance, faced an uproar in the 1980s, when publishers treated book-buying bureaucrats to plush golf weekends and moonlight yacht cruises. Last year, California education chief Delaine Eastin caught flak for taking campaign contributions (inadvertently, she claimed) from a publisher's parent company while millions in new book purchases were pending.

Recent evidence suggests critics are right to worry that today's standards aren't high enough. In the well-regarded Third International Mathematics and Science Study for example, fourth-graders scored above world averages in math, only to dip below average by eighth grade.

Many educators attribute the drop to curriculums and texts that cover twice as many topics in less depth than, say, Japan.

Another respected achievement measure, the National Assessment of Education Progress, reveals an enormous gap between what states consider adequate performance and what the same students score on national assessments. For example, 68 percent of North Carolina's eighth-graders meet the state's math standards; just 20 percent are considered "proficient" or "advanced" by the NAEP.

It would be crazy, of course, to blame texts for everything that ails American schooling. But their influence should push the standards debate beyond today's ideological posturing.

The real debate we need isn't whether to have national standards but over who should set them and how. And if three states working with one oligopoly set de facto standards that aren't good enough, maybe, just maybe, we need a federal call for something better. ○

The editorial panel thanks Jeffrey S. Moore, of Moreland Hills, Ohio, jsmoore@aol.com, for sending in this essay. Readers are encouraged to send other such essays that address contemporary issues in mathematics education to Johnny Lott, editor-designate of *Dialogues*, 215 South Fifth Street East, Missoula, MT 59801.

A Reaction to: "Who Should Set the Standards?"

by Eric Robinson and Margaret Robinson

We agree with the comment made in Matthew Miller's editorial "Who Should Set the Standards?" that commercial instructional materials (textbooks and attendant teacher resources, etc.) can have "enormous influence" on topics covered in U.S. classrooms. However, we view this landscape from a different perspective in the sense that we feel, ideally, this is as it should be. That is, while classroom teachers need to make materials "their own" and supplement or modify where they see fit, they should not be expected to create a majority of the curricular material, especially standards-based curricular materials, from scratch.

In contrast to this ideal, our observations lead us to believe that many classroom teachers do not tacitly accept the curriculum as presented in the look-alike texts; rather, they spend a tremendous amount of time developing supplementary and replacement material using other sources in order to make mathematics meaningful for their students. Even though there are good alternatives to the look-alike materials out there, they may not be viable options for a variety of reasons. For example, in some cases, rigidly designed state frameworks or measurement instruments severely restrict textbook choices. In other cases, state or local adoption processes make it difficult for some smaller publishers even to compete.

The current set of NCTM *Standards* and the draft *Principles and Standards for School Mathematics* do represent a "national," but not federal, call for "something better," and the field has been and is responding. In some cases, funding was secured by teams of instructional-materials developers that afforded them both the time and resources to carefully consider what a contemporary school student should know and be able to do in mathematics. We have thoroughly reviewed many such projects at each of the school levels that received funding from the National Science Foundation and can attest to the fact that they provide several excellent and distinct standards-based curricular choices.

Although a case can be made for some country-wide uniformity in content, we must be careful to avoid a mandate in the form of a politically selected and legislated laundry list of required content topics that stultifies the curriculum and drowns us in less than an inch of curricular depth. ○

Eric Robinson and Margaret Robinson are both members of the faculty in the Department of Mathematics and Computer Science at Ithaca College, Ithaca, New York. Eric is a mathematician and former chair of the department. Margaret's interest is teacher education. They are currently directing the COMPASS project, which focuses on the implementation of standards-based high school curricula.

Toward a National Consensus

continued from page 3

the curriculum is one of those choices defended as parental or local control. The consequence of such a choice may well be the "mile wide inch deep" curriculum, the largest textbooks in the world and a splintered vision of what children should learn in mathematics.

How do most of the 40 other nations in TIMSS avoid such a characterization of their curriculum? They are organized differently; the vast majority have a national ministry where decisions about the content of the curriculum are made. A small minority of countries have regional ministries, but even here, the regions are small in number and there is usually a formal mechanism for national coordination. Such a centralized form of curricular decision making occurs even though the control of the schools in many other ways is not centralized. Some of the TIMSS countries have numerous educational systems, including public, private, and religious, but the decisions about curriculum are still located in a national ministry.

Given the historical nature of dispersed decision making in the United States (where decisions about the curriculum are left to state and local control), and given the more than 15 000 local U.S. school districts, it is clear how such a splintered vision would manifest itself. Compounding the 15 000 visions of school mathematics are U.S. textbooks and standardized tests written to be sold in a national market. The resulting marketing strategy encourages the inclusion of almost every topic at every grade level in textbooks and test items aimed at those topics in order to make the materials saleable in every one of these 15,000 districts. TIMSS data tell us that teachers try to teach all these topics, so what is in these textbooks and standardized tests is important. ●

It's Time for a Global Mathematics Curriculum

I have a dream. It's a recurring dream with subtle variations and changing nuances but always with a common theme—a universal curriculum in mathematics! That's right; it's a curriculum that has all students in Grade 4 studying the same mathematics whether they live in Los Angeles, Tokyo, Sydney, or Johannesburg. But that's not all. The students are using identical sets of instructional materials that incorporate the latest research on how children learn while exploiting the advantages of both the old and new technologies. These resources have been field-tested, revised, polished, and honed over several years so that teachers know how to use them with students and are provided with exemplars of student work and rubrics to help them assess each student's work with respect to a universal standard.

This curriculum and these learning resources are not the agents of a Procrustean-bed approach to teaching and learning that forces all students into a common mold. On the contrary, they are replete with rich learning activities that engage the least-motivated students at one level and provide the gifted with limitless opportunities for challenging their talents at a higher level. The huge global market has enabled the publishers of these materials to hire a cadre of the world's most creative and insightful professionals with collective expertise in mathematics, mathematics education, media design, etc. to create, field-test, revise, and disseminate these multifaceted materials. The economy of scale has enabled the publishers to offer these materials at a fraction of current costs, enabling all schools to have complete sets of all components of the program.

BEST COPY AVAILABLE

Since the curriculum and these learning resources are universal, teachers in training at faculties of education and teachers' colleges throughout the world graduate with a deep understanding of the curriculum and a high level of expertise in the classroom implementation of these resources. Practicing teachers are so familiar with the curriculum and the resources that they develop high levels of sophistication in anticipating questions, posing problems, assessing student progress, and referring students to a compendium of resources.

In my dream, I imagine a class of Grade 8 students in Chicago watching an exciting video about the magnificent African elephant. The video describes the endangered status of this species and the depletion of its population through poaching and loss of habitat. It also presents various conservation measures, such as the ban on ivory sales in 1990, and asks whether or to what extent these measures have been effective. At the conclusion of the 10-minute launching of the lesson, a charismatic teacher with a passion for learning initiates an animated discussion of these issues with the class.

Once it is clear that students have a grasp of the important concepts, they are asked to compose a report on the elephant, including graphs that show the changing elephant populations during the last two decades by region, stem-and-leaf plots that show the distribution of masses of tusks in an elephant herd, and quantitative data that support the students' assertions about the effectiveness of various conservation methods.

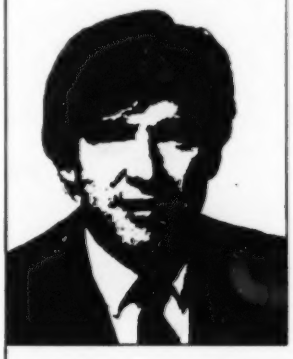
To obtain the necessary information, students work with interactive courseware at computer stations. Some students may communicate via the Internet with Grade 8 students in a sister school in Zimbabwe who are working on the same unit. Their African colleagues may shed some light on the problems, such as the trampling of crops by marauding elephants, from the African perspective. They might even discuss whether a stem-and-leaf diagram is the most appropriate format for displaying the distribution of the masses of the tusks. When the students submit their completed reports, the teacher is able to assess this work relative to exemplars from all over the world and use these reports and their exemplars constructively to encourage further student learning.

In this dream, international studies such as TIMMS are no longer necessary because student performance is monitored continuously, and deficiencies related to local and international standards are remedied as they emerge. Differences in student performance within a single class are observed to be significantly greater than national differences. In the global village, virtually all contexts for mathematics are of universal interest. The population explosion, global warming, deforestation, the Olympics, the world economy, and most events of significance are relevant to all. (A few applications embedded in culture-related contexts are contained in ancillary resources created at the local level.) Context-free mathematics, such as the study of prime numbers or Pascal's triangle, is seen as equally appropriate for the mathematical development of a student performing at a Grade 7 level in New York as it is for a Grade 7 student in Beijing.

There is a tacit understanding throughout the world that mathematics is the universal language and that its teaching and learning transcend cultural differences. The geographic location of a student is not considered relevant, and only readiness to learn is a consideration. Both the universal curriculum and the learning resources are monitored and fine tuned on a continuous basis by an international cadre of world-class mathematics educators and practitioners to exploit new technologies and accommodate research findings about teaching and learning.

In my dream, I remember how NCTM's *Curriculum and Evaluation Standards for School Mathematics* (1989) and its revision, *Principles and Standards in School Mathematics,* published a decade later, had taken the first step toward this universal mathematics curriculum. I remember also how the western provinces in Canada together formed the *Western Canadian Protocol* and issued a common set of guidelines for mathematics titled *The Common Curriculum Framework for K–12 Mathematics* (see page 8). These were preludes to the numerous territorial struggles and hotly contested issues of governance that occurred as states and provinces gradually relinquished their claim on the domain of mathematical learning in favor of an international group with loftier goals and greater insights. Once Canada and the United States achieved a common curriculum, it spread quickly to Europe, and then it became worldwide.

The dream usually ends at the moment when we are attempting to extend the universal mathematics curriculum to a new colony established on the moon. Then, poof!—I'm catapulted back into reality and the realization that it is still only the twentieth century. I feel a brief lament and then the comforting realization that we can't stay in the twentieth century forever. ○



Brendan Kelly teaches mathematics education at the Ontario Institute for Studies in Education (OISE). He has a Ph.D. in mathematics with a specialty in number theory from the University of Toronto (UT) and an Ed.D. in computer applications from UT/OISE. He has written textbooks at all levels from kindergarten through college and has a particular interest in the application of technology to mathematics and mathematics education.

The Western Protocol—
An Attempt at Multiprovincial Control

by Cynthia Ballheim, *for the Editorial Panel*

Provincial control of education in Canada is not a new concept. Curricular documents, prescribed resource lists, and detailed programs of study are the norm and are prepared by provincial departments of education. What is new is the multiprovincial attempt at curriculum control that is now underway. In December of 1993, the *Western Canadian Protocol for Collaboration in Basic Education Kindergarten to Grade 12* was signed by the ministers of education from Manitoba, Saskatchewan, Alberta, British Columbia, Yukon Territory, and the Northwest Territories. The protocol states that the four western provinces and the two territories agree to collaborate in basic education.

The reasons for this partnership revolve around the importance placed on—

- common educational goals;
- high standards in education;
- removing obstacles for student access to educational opportunities, which includes improving the ease of transfer from jurisdiction to jurisdiction;
- optimum use of educational resources.

Developed in collaboration with teachers, administrators, parents, business representatives, post-secondary instructors, and others, the Common Framework identifies beliefs about mathematics, general and specific student outcomes, and illustrative examples agreed upon by the six jurisdictions. It divides the mathematics curriculum from K–12 into four strands—number, patterns and relations, shape and space, and statistics and probability—which are designed to be influenced by mathematical processes (of communication, connections, estimation and mental mathematics, problem solving, reasoning, using technology, and visualization) as well as beliefs concerning the nature of mathematics (change, constancy, dimension, number, pattern, relationships, shape, and uncertainty).

Each of the provinces and territories has been able to determine when and how the Common Framework is to be implemented within its own jurisdiction. As such, each one of them is on a slightly different time schedule. Alberta has been the first to implement the protocol. The elementary and junior high school programs are already on stream, as is one part of the high school program, the pure mathematics focus at the Grade 10 level. The mandatory implementation of the applied mathematics focus at the Grade 10 level has, however, been delayed, although many Alberta high schools have chosen to implement this stream on a pilot basis. Reasons for the delay center on post-secondary acceptance and the readiness of teacher resources—not the intent of the program.

Will the four western provinces and two territories ever be aligned according to the vision of the protocol? Should they be? Is it realistic to think that so may people can come to agreement about that small piece of mathematics that we call the curriculum? If one of the purposes of this program is to provide ease of transfer between provinces, why is it that current Alberta Grade 10 students will not be able to move from high school to high school even within the province without finding themselves at different stages in the implementation? Will multiprovincial control stifle creativity, ignore individual regional differences, and cause all to sink to the lowest common denominator? Stay tuned as the process continues. ○

Line Dancing in Texas

One State's Experience in System Alignment

by Cathy Seeley

Texas has a long and deeply entrenched history of state control of education. Through most of the twentieth century, that control rested primarily with the state's powerful textbook adoption system and with extensive reporting requirements for local districts. In the 1980s, Texas implemented the first steps in a continuous improvement strategy for its educational system.

In mathematics, the state's first attempt to mandate a set of curriculum guidelines, the *Essential Elements*, defined a list of expectations for the mathematics skills and concepts that students would "have the opportunity" to learn. The state's accountability system for students was then aligned with that curriculum. While limited by a multiple-choice format, the mathematics content of the *Texas Educational Assessment of Minimum Skills* (TEAMS); its successor, the *Texas Assessment of Academic Skills* (TAAS); and the recently revised state standards, now known as the *Texas Essential Knowledge and Skills* (TEKS), has strictly followed the state mathematics curriculum framework. The TEKS outline clear expectations for what students should know and be able to do, rather than simply what they will have the opportunity to do. A particularly important lever for raising standards is the broader accountability system that recognizes only schools where performance of every race and ethnicity, socioeconomic status, and gender subgroup of students is high.

Beyond this fundamental alignment of curriculum, assessment, and accountability, state-level activities in Texas mathematics have targeted other critical components of the educational system as well. The TEKS provide the basis for adopting instructional materials and for the Eisenhower-funded statewide mathematics professional-development system. Goals 2000 funds and state-legislated professional development funds have supported this program, a series of professional-development experiences on the TEKS for administrators and other leaders, and a rich set of technology-based teacher resources for implementing the TEKS. Recent Title I activities have brought together mathematics educators and Title I staff to work on mathematics improvement around the TEKS. The state's National Science Foundation-funded Statewide Systemic Initiative has brought more resources toward these and other activities in support of the state's standards.

Texas has recently been recognized in a report of the National Education Goals Panel as one of two states (with North Carolina) making dramatic increases in student mathematics achievement. Texas has been singled out as the only state making significant strides in closing the mathematics achievement gap among ethnic and socioeconomic subgroups.

Yet Texas mathematics educators know that much work remains. In too many schools, alignment of the curriculum with the state test is overshadowed by efforts to simply raise test scores with superficial practice of short multiple-choice items. Changes in the textbook-adoption process have provided schools with little information on how well or how deeply the TEKS are addressed, thus shifting the burden for more careful analysis of materials to the local level. The accountability system needs to include more rigorous high school measures to encourage secondary schools to move all students toward high, grade-level standards. And while huge strides have been made in mathematics performance of every subgroup of Texas students, achievement is not yet adequately high for all students. Although far from perfect, the seeds of success in mathematics learning that are beginning to grow across Texas support the state's commitment to refine, not discard, the system. ●

For additional information, see the Texas Statewide Systemic Initiative website: www-tenet.cc.utexas.edu/ssi.

Cathy Seeley currently serves as director of policy and professional development for the Texas Statewide Systemic Initiative in Mathematics and Science. From 1984 to 1991 she was director of mathematics (K–12) at the Texas Education Agency. She has been a junior high and senior high school mathematics teacher, a K–12 mathematics supervisor, and has taught at several universities.

The Influence of Postsecondary Education

by Roger Day

The taught mathematics curriculum in secondary schools today is influenced by many factors. Some of these factors are local, such as textbook selection, district goals and tests, students, teachers, and resources in a school system, but many are external and may be very complex. Consider a typical public high school mathematics department like the one in Morton, Illinois. What are some of the external factors that influence the taught mathematics curriculum?

In the school, mathematics department members likely pay special attention to the *Illinois Learning Standards* (ILS) for mathematics, standards against which the students and teachers will be evaluated as part of Illinois' comprehensive school testing program. The ILS contains curricular components, including aspects of probability, statistics, and data analysis, that may not have been in the curriculum the teachers "grew up" with, as well as uses of technology that teachers may have yet to experience. The ILS and the resulting evaluation program certainly affect teaching and learning.

Eighty-five percent of Morton's students continue their education beyond high school. The school is expected to prepare those students to be academically successful, especially in collegiate mathematics courses. Mathematics teachers learn from former students and from others that some college and university mathematics instructors restrict or disallow the use of graphing calculators and handheld computer algebra systems in first-year courses. The local teachers then must make decisions about whether to adopt reform-based curricula with technology integral to its content and pedagogy. If students cannot use the technology in collegiate courses, should the department adopt textbooks that depend on it?

Parents and students expect preparation for tests that determine students' college admission and placement in college mathematics curricula as well as the curricula itself. Thus, the taught curriculum in high school is influenced by admissions and placement tests, by the response formats of those tests, and by the use of technology on those tests. Because many tests remain heavily focused on preparation for success in calculus-track symbol manipulation courses, is it in the best interests of students for a high school mathematics department to adopt an integrated curriculum that may not have calculus as its focus?

Some of Morton's college-bound students also intend to compete in athletics, meaning that the school's core curriculum comes under scrutiny of the National Collegiate Athletic Association (NCAA). The NCAA requires every high school that produces Division I or II athletes to certify that the school's courses prepare students for college. A prospective collegiate athlete must take mathematics courses that meet curriculum guideline established by the NCAA. Until recently, school mathematics courses that deviated from the traditional curriculum were not reviewed favorably by NCAA representatives. Again, an external agency has a significant impact on the taught mathematics curriculum.

State and national tests, use of technology, postsecondary courses and programs, and outside agencies are just a few of the prominent forces beyond a department's boundaries that may influence its taught curriculum. These complex and deeply entrenched forces affect teachers and have no small impact on decisions teachers make trying to meet the needs of students. ●

Roger Day, day@math.ilstu.edu, teaches at Illinois State University, Normal, Illinois. His professional interests focus on preservice secondary mathematics teacher development and the implementation of technology in secondary school mathematics.

Standards: A Resource for Curriculum

by Joan Ferrini-Mundy

In many ways, content standards documents, such as NCTM's 1989 *Curriculum and Evaluation Standards for School Mathematics*, and the 1998 *Principles and Standards for School Mathematics: Discussion Draft* (PSSM) are best defined by what they are not. They are not instructional materials, lessons, or prescriptions for teachers. Standards are designed and intended to have a strong influence on all of these areas. These *Standards* documents include statements of goals, developed by members of the mathematics education profession, designed to provide opportunity for input and discussion among K–12 teachers, mathematicians, and mathematics educators concerned about the nature and direction of school mathematics.

The 1989 *Standards* was offered as:

> ... a framework for curriculum development. However, it contains neither a scope and sequence chart nor a

Joan Ferrini-Mundy is with the National Research Council. She is the Chair of the Standards 2000 Writing Group. The views expressed herein are those of the author and do not necessarily reflect the views of the Standards 2000 Writing Group or NCTM.

listing of topics by specific grade level. This is deliberate; a coherent network of relationships exists among the identified topics, and multiple paths are available throughout this network .... One possible next step is for teachers and mathematics educators to develop curricula based on the standards. (p. 252)

PSSM assumes a similar stance:

> The combination of principles and preK–12 standards ... are intended as guidance to those who design, plan, implement, and evaluate practices, policies, and programs in mathematics education. (p. 14)

Curriculum can be viewed in a variety of ways, but generally it is considered to include content, organization, emphasis, and teaching. PSSM was not written with the explicit intention of prescribing organization and emphasis. However, because standards need to be included in some linear order, many take this order to be a signal about importance or intended emphasis. But the view expressed in 1989 about "multiple paths available through the network" still applies. And, although we address issues of emphasis in a global way (e.g., number will not be emphasized as much at 9–12 as in preK–2), the more fine-grained questions of emphasis and balance will need to be addressed by curriculum developers and classroom teachers and will need always to respond to local needs and context. As for teaching, the view presented in PSSM is that teaching is a process of making informed decisions based both on goals and understanding of where students are.

So, on none of the traditional elements of curriculum can it be said that standards are meant to "control" practice. Teachers and students together control the "enacted" curriculum inside of classrooms. But teachers should have access to the best tools available for enacting that curriculum, tools such as instructional materials; knowledge about students, mathematics, and teaching; and local and state guides and frameworks. Standards, produced through careful and extensive collaborative processes, representing considered professional judgments about what students should know and be able to do, can serve as a fundamental tool for the endeavor of improving mathematics education for all. ●

Determining What Is To Be Taught:
The Role of Assessment

by Nancy S. Cole

The determination of what should be taught is a social and political enterprise. In the middle of this milieu are tests that often carry inordinate weight in defining what should be taught but that may escape the full scrutiny of the social-political process because of their presumed scientific neutrality or unassailable objectivity.

Testing cannot be neutral on what is taught and learned. Any test is an expression of values on teaching and learning. I believe the same social and political processes used to set curriculum directions must be applied to testing. In fact, large numbers of educators set specifications, write questions, and review most tests in wide use. However, without a clear understanding of how to align tests with teaching, such processes are hollow. One of the failings of the reform era is our limited progress in understanding this alignment.

Once we understand the alignment, we will still face the question of whether to align national tests with the most widely used teaching practices or the most forward-looking ones. To stay too close to current practice is to fail to support improvement; to be too far in front is to be unfair to the mass of teachers and students.

Our best hope is to view testing as a critical and integrated part of the teaching-learning process, subject to the same public review and scrutiny in setting what should be tested as in determining what should be taught and learned. ●

Nancy S. Cole is president of Educational Testing Service and a researcher and writer on issues of testing policy and test fairness. She is a past president of the American Educational Research Association and the National Council on Measurement in Education and a former member of the Mathematical Sciences Education Board of the National Research Council.

BEST COPY AVAILABLE

Who's in Control?

NCTM Members Speak Out!

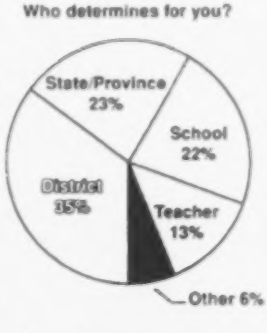
by Peggy House,
for the Editorial Panel

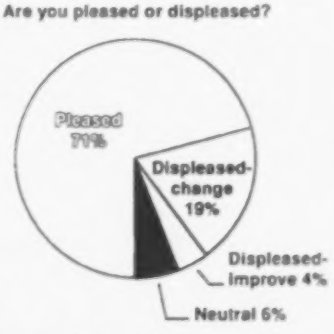
In the previous issue, *Dialogues* posed two questions: "Who determines what is taught in your school?" and "Are you pleased or displeased with this arrangement?" We heard from 376 readers from 47 states, three Canadian provinces, and two foreign countries, 364 of whom responded to these questions. Their responses indicate that the school district is the most likely determiner of curriculum (see chart below), although many of the replies were accompanied by notes explaining that the decision maker's curricular choices are influenced by a higher authority. "My district (or school) sets the curriculum in accord with state (or district) frameworks/guidelines" was a common response. Most of the responses classified as "other" indicated that curriculum was set by a collaboration of all of the agents.

Perhaps the most surprising finding was that more than 70 percent indicated that they are pleased with whatever arrangement they have. Of those who indicated their displeasure, slightly more than one in six explained that they are not displeased with *who* is making the decisions, only with *how* the decisions are implemented—in other words, the agent *should* make the decisions but should do a better job of carrying them out.

Sixty-eight respondents would like to see the locus of curriculum decision making changed: 29 to a "higher" level and 33 to a "lower" level.

The other six recommend a collaboration among states or provinces, districts, schools, teachers, and parents.





Set at higher level:	
National	14
State	8
District	6
School	1

Set at lower level:	
District	11
School	16
Teacher	6

Here's a sample of what our readers said:

National standards should be set for all students. My expectations for students should not be dependent upon local or regional or statewide agencies. *All* children in the U.S. deserve the same level of instruction, regardless of their socioeconomic background or place of residence.

Camille Scully
Seventh-Grade Teacher, New Jersey

I have the final say as to how the curriculum will be taught.

Lucy Hahn
Second-Grade Teacher, Idaho

I believe a general curriculum is understood. Based on that, the principal is responsible to see to it that the students receive a proper education. That should be delegated to a qualified department chairperson.

Brother David Detje
Seventh-Grade Teacher, New York

It should be enough for my own school district to determine the curriculum for Chilliwack.

Ron Andrew
High School Teacher, British Columbia

The state or province or national body should determine the main outcomes of the curriculum, but there should be flexibility and room to expand or add to meet the needs of the students in individual communities or classrooms.

Diane Wells
Fourth-Grade Teacher, California

I see some merit to district-adopted curriculum for the sake of consistency. However, many times adherence to district requirements impedes teacher creativity and hampers her/his instructional practices.

Amelia (Amy) Young
Third-Grade Teacher, Arkansas

A national curriculum like Goals 2000 will just be one of the symptoms that destroy this country as we know it.

Doug Spencer
High School Teacher, New Jersey

We are accountable to the parents and must never abdicate to the federal government. That would be disastrous.

Wayne Rydberg
Seventh-Grade Teacher, California

We need a national curriculum. It should be skeletal in nature so that each state, district, and school can fill in the "flesh."

Robert McCollum
High School Teacher, Illinois

A strong state core curriculum helps guide novice teachers and also helps drive an appropriate uniform curriculum. It forces teachers to teach important mathematics.

Diane Suddreth
Eighth/Ninth-Grade Teacher, Utah

The curriculum is determined by the texts which are selected because of their content, which is determined by two things: (1) preparation for the SATs, and (2) it is what we think we have always taught.

Jack Withrow
High School Teacher, Virginia

I support a national curriculum. Southern states are often accused of providing inferior education. If we had the same curriculum, we might improve the quality of education across America.

Sheri Tallon
High School Teacher, Alabama

I'd love to determine my own curriculum, but with 38 years of teaching experience, I feel competent. Realistically, my experience as a department head and supervisor tells me that most teachers need guidelines.

Sister Alice Hess
High School Teacher, Pennsylvania

I *hate* having sole responsibility for my curriculum. Some district expectations would be welcomed.

Eleanor Schrodt
Eighth-Grade Teacher, Iowa

We have conflicting demands from the university where many of our students want to go to college, and the state regents. I think higher standards are a positive force, but not for all students. Schools need more flexibility in implementing the standards.

Cathy Wilkerson
High School Teacher, New York

It seems to me that, in many cases, we let textbook publishers determine our curriculum. Even if a school, school board, or state department of education has adopted a curriculum, the teacher implements it using a textbook (often prescribed by the curriculum-adoption agency). I have yet to see a "standard" textbook that embraces all that the NCTM *Curriculum Standards* embody; I do see efforts on the part of many publishers to nod to the *Standards*, without really adapting content and presentation. Some of the new high school curricula built from the ground up ... are very promising, but convincing schools/districts to try them has been difficult.

Craig Russell
Middle/High School Teacher, Illinois

The state should provide a basic curriculum with liberty going to the schools or teachers on how it is taught and exactly what is taught.

Rebecca Darrough
Computer Programmer, Missouri

Although I am pleased with the state setting some standards, they have not been providing adequate leadership with curriculum development.

Kalle Hildebrandt
Fourth/Fifth-Grade Teacher, Oregon

Principals have complete autonomy. Area specialists should coordinate with committees of teachers to establish district curricula.

Raymond Whipple
High School Teacher, Massachusetts

The local district should have more input into its curriculum. The state seems to think everyone is going to college, with little in the present curriculum for noncollege [bound] students.

George Knight
Teacher, Mississippi

The State Board of Regents has no idea of what works in teaching and learning.

Janet Taubin
High School Teacher, New York

In inner city schools like mine, there are the state or district mandates in theory, but teachers determine the curriculum in classrooms. In many rooms, that means little or no math.

Muriel Avanaba
Fifth-Grade Teacher, California

I think there should be national standards and consistency in the district, but I need to include student- driven interests and variance in abilities to meet all needs.

Joanne Rowe
Kindergarten Teacher, Michigan

I believe the decline in students' mathematical abilities across the state and nation is because there is no consistency in what is taught.

Angela Messer
High School Teacher, Kansas

If our state is going to give (require) state testing, then they should also be providing a curricular guide.

Shaun Jeanquart
Eighth-Grade Teacher, Wisconsin

The state should determine it, but in my state some standards are not realistic—e.g., in math, although most concepts are reasonable, the amount of knowledge required isn't.

Martha Tomkins
Fourth-Grade Teacher, Ohio

Ultimately, I make the specific choices. The other sources define the parameters.

Peter Mayhew
High School Teacher, Michigan

We should all continue to have input, but we need a more formal outline of agreed-upon expectations so that I know whether the decisions I make meet the proper guidelines.

Courtney Morgan
Fifth-Grade Teacher, Washington

Curriculum is an on-going document that needs teacher input and help from the state department of education for new trends.

Pat Moye
Sixth-Grade Teacher, retired, Alaska

Although a small amount of standardization is desirable, excellence can better be achieved when local strengths can be maximized.

Ken Thwing
High School Teacher, North Carolina

It's hard to determine who the expert is, but teacher input is crucial.

Robert Foote
Sixth/Seventh-Grade Teacher, Illinois

I am pleased because I am on the curriculum committee and have input.

Patricia Koss
Middle School Teacher, Connecticut

The curriculum needs to be K–12, not the 9–12 and fragments we currently have.

Susan Osberg
High School Teacher, Rhode Island

There should be flexibility but not chaos. Students move around a lot, and it is sometimes difficult to fit in a student from a system that's very different.

Mary Wallon
High School Teacher, Washington

A national curriculum is imperative in this age of globalization. Consistent standards, regardless of where one lives, are needed.

T. Paradellis
High School Teacher, Ontario

I do not believe there should be a national curriculum. This is a local issue that should be balanced with the teacher of the local classroom.

Janet Thomason
High School Teacher, Arkansas

Reactions to Tracking

Cynthia Ballheim, *for the Editorial Panel*

In our last issue of *Dialogues*, we asked our readers to respond to two questions related to tracking. The first was "At what grade should students be separated from other students for mathematics instruction if they are not performing as well as those students?" The second question, related to acceleration or special enrichment, was "At what grade should students first be separated from other students for mathematics instruction if they are performing better than those students?" In both cases, our readers were asked to consider the population of all students except the learning disabled, the extraordinarily gifted or others who might be on individual learning plans. Of the over 360 responses received from K–12 teachers, only 22, or 6 percent, advocated never separating at all, under any circumstances. The majority of the replies favored separation for both remediation and acceleration.

Responses were evenly distributed across all grade levels except 10, 11, and 12 as to when the separation should first occur. A consistent response was that separation (for either remediation or acceleration) should begin as soon as the "need" was realized and that the ideal result of such separation would be a goal of timely inclusion. The call for "flexible groups" was strong. Many spoke of keeping the doors open for students and allowing them all to reach their potential. The majority of our readers said that it was never too soon to help students who are struggling or to advance those who are bored. They felt that students should work at developmentally appropriate grade levels, and a few even suggested that mathematics should be taught as a nongraded subject.

Here is a sample of what our readers have to say:

Early intervention can get students back on track.

Kathy Granger
Resource Teacher, California

Students need to be held responsible for their lack of effort. A student who cannot do 4th grade math is not ready for high school math.

Don Wilson Jones
High School Teacher, Alabama

As early as needed and only if it is flexible tracking ... A particular student may only need one day of one-on-one help, whereas another may need several months or years. I think that students that need acceleration before high school should have an "in class" program designed for them. Too many students seem to be accelerated because they can handle the problem solving but have missed the basics.

Kathy Martin
Middle School Teacher, Montana

I am very interested and concerned with this issue. There is such a need for alternative programs. Education must change.

Michael Greenfield
Fifth-Grade Teacher, New York

By streaming only mathematics, we are wrongly giving it status above any subject. Why is it that the best mathematics students need accelerated programs, but the best writers do not? In my opinion, the right message to give to our students is that we prize the diversity of talents within our classroom. It is the dexterous athletes, brilliant writers, skillful artists, and creative problem solvers and thinkers that transform a class of students into a community.

Eric Golombeck
Fifth-Grade Teacher, Pennsylvania

Students who are ready, willing and able to learn should be given the chance to do so. There is so much "neat" math to learn. Interest must be cherished. Time must not be wasted.

Doris Turner
Middle School Teacher, Kentucky

Once a student has achieved mastery she/he should be placed back into the "regular" track ... not in remedial classes for life. If these students, especially girls, are not challenged and motivated early, potential math and science careers will be most likely lost.

Daniel D. Simon, Sr.
Supervisor, New Jersey

Teachers should give special help to students who need a better understanding of numbers and provide extra challenges for those who are ready for them.

Lorene Ellerbrake
Elementary Teacher, Nebraska

Less able students need a firm foundation—otherwise they become frustrated and drop out. If young students are to love mathematics, they must be challenged.

Bernadette Burroughs
High School Teacher, Virginia

Students that struggle early can be remediated much more easily than those that have lived with false ideas or confusion for many years.

Amy Calisti
Middle School Teacher, Pennsylvania

I tell students that everyone has a "math button," but not all buttons are programmed to "go on" at the same time.

Anne Strasser
High School Teacher, Virginia

The basic addition, subtraction, and multiplication facts from memory/speed need to be assured first.

Sister Helene Therese Stanislaus
High School Teacher, Maryland

If this [the survey reported in the issue] is at all representative of the NCTM membership at large, it certainly does not seem to provide much support for heterogeneously grouped core mathematics classes. I was also interested to note that the antitracking excerpts were from the 1985 book "Keeping Track" by Jeannie Oaks whereas the pro-tracking article "Tracks to Success" quoted a 1998 article that looked at 26 studies and two meta-analyses done since 1992.

Kim Mackey
High School Teacher, Alaska

An article in the November 1998 issue of the *Journal for Research in Mathematics Education* (JRME) offers some interesting perspectives on tracking students based on ability levels. The Israeli researchers, Liora Linchevski and Bilha Kutscher, investigated the effects of placing students in mathematics classes that were tracked by ability levels (homogeneous groups) and those in which students of all ability levels were in the same class (heterogeneous groups). They found that the achievements of high ability students in heterogeneous classes were not compromised but that the achievements of average- and low-ability students were significantly lower in heterogeneous classes.

Judith T. Sowder
University Teacher, California, Editor, JRME

Mathematics Education

Dialogues

Questionnaire

Please respond by 15 May 1999

Please take a few minutes to fill out this questionnaire. Completed forms can be folded, taped, and returned, postage free, to NCTM or faxed to A. Reeves, Editorial Services Unit, at the Headquarters Office at (703) 476-2970. Please use regular mail or e-mail (*dialogues@nctm.org*) for longer responses.

PART 1: *Personal and professional information; please print clearly.*

Name _____

Street address _____

City _____

State/Province _____ Zip code _____

Home phone ( ) _____

Work phone ( ) _____

E-mail _____

Employer: _____

Main position:

- ○ K–12 Teacher (Specify grades): _____
- ○ Community college
- ○ University/College teacher
- ○ Supervisor/Administrator/Consultant
- ○ Other _____

PART 2: *Questions and comments for future issues*

A future issue of ***Dialogues*** will deal with basic skills. Skills are usually called "basic" when (1) they are deemed necessary for later mathematics or (2) they are deemed so important that everyone should learn and be tested on them. Indicate whether or not you think the topics listed here are basic.

Basic	Not Basic	
		Arithmetic
○	○	memorizing +, −, ×, and ÷ whole number facts
○	○	paper-and-pencil computation with 3-digit whole numbers
○	○	paper-and-pencil computation with 3-digit decimals
○	○	paper-and-pencil + and − with 5-digit whole numbers
○	○	paper-and-pencil × and ÷ with 5-digit whole numbers
○	○	computation using calculators with whole numbers
○	○	computation using calculators with decimals
○	○	operation uses—knowing when to use an operation
○	○	operation properties—e.g., commutativity of multiplication
○	○	+, −, ×, and ÷ of fractions with denominators < 10
○	○	+, −, ×, and ÷ of fractions with denominators > 10
○	○	+, −, ×, and ÷ of mixed numbers
○	○	reducing a fraction to lowest terms
○	○	finding the gcf and lcm of two or more whole numbers
○	○	converting a fraction to a decimal
○	○	translating into and out of scientific notation
○	○	calculating square roots by hand
○	○	finding square roots with a calculator
○	○	simplifying radical expressions like $\sqrt{50}$ by hand
		Measurement
○	○	using tools (rulers, etc.) to measure length
○	○	using tools (protractors, etc.) to measure angles
○	○	converting units within a system (e.g., miles to feet)
○	○	converting between systems (e.g., Fahrenheit to Celsius or centimeters to inches)
		Estimation
○	○	using rounding rules to check computation
○	○	determining potential errors resulting from the use of estimates
		Algebra and Functions
○	○	solving linear equations by hand
○	○	solving equations with a calculator
○	○	adding algebraic fractions with monomial denominators
○	○	multiplying binomials
○	○	using the quadratic formula
○	○	graphing quadratic functions by hand
○	○	graphing functions with a calculator
○	○	knowing properties of the logarithm function
		Geometry
○	○	applying the Pythagorean theorem
○	○	using formulas to find area and volume of common shapes
○	○	doing triangle congruence proofs
		Probability and Statistics
○	○	determining simple probabilities
○	○	determining mean, median, and mode
○	○	finding the line of best fit for an appropriate set of data
○	○	knowing the meaning and implications of randomness in samples
		Problem-Solving Strategies
○	○	drawing a picture to solve a problem
○	○	making a table to solve a problem
○	○	finding a pattern to solve a problem
○	○	writing and solving an equation to solve a problem

(Part 3 of this questionnaire is on the reverse side.)

PART 3: ***Questions and comments related to the ideas in this issue***

We are interested in your responses to the ideas in this issue of *Dialogues*.

Do you think there should be a national curriculum? ○ Yes ○ No

If so, why, and who should determine this curriculum? _____

_____

_____

_____

If not, why not? _____

_____

_____

_____

We invite longer responses to these questions in the form of 200-word essays. We also invite you to send us essays on controversial issues in mathematics education, either written by yourself or by another author, published or unpublished.

Thank you! The members of the *Mathematics Education Dialogues* Editorial Panel sincerely appreciate your time and interest; your comments will help improve subsequent issues of Dialogues. The Editorial Panel members are: Zalman Usiskin, editor; Cynthia Ballheim; Hyman Bass; Peggy Hörse; Johnny Lott, editor designate.

dialogues@nctm.org

National Council of Teachers of Mathematics
1906 Association Drive • Reston, VA 20191-1593

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 2206 STERLING, VA

POSTAGE WILL BE PAID BY ADDRESSEE

Mathematics Education *Dialogues*
National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 20191-1593

BEST COPY AVAILABLE